[FIG.1]

I-AXIS SIGNAL (+1)

Q-AXIS SIGNAL (+1)

I-AXIS SIGNAL (-1)

5 Q-AXIS SIGNAL (-1)

[FIG.2]

PRECEDING SIGNAL POINT

FOLLOWING SIGNAL POINT

10 PRECEDING SIGNAL PERIOD

FOLLOWING SIGNAL PERIOD

[FIG.4]

NYQUIST WAVE INSERTED AT T/2

15 INTERFERENCE OCCURS BECAUSE THIS IS NOT NULL

NYQUIST WAVE INSERTED AT T/2

BECOMES NULL

[FIG.6]

20 ROTATION FOR LINKING SIGNAL POINTS

[FIG.9]

I-AXIS (POSITIVE)

Q-AXIS (POSITIVE)

25 I-AXIS (NEGATIVE)

Q-AXIS (NEGATIVE)

[FIG.10]

I-AXIS (POSITIVE)

Q-AXIS (POSITIVE)

ONE MORE SYMBOL CAN BE ALLOCATED FOR EACH AXIS BY CARRYING

5 OUT PRIMARY MODULATION

I-AXIS (NEGATIVE)

Q-AXIS (NEGATIVE)

S-AXIS (NEGATIVE)

T-AXIS (NEGATIVE)

10 THESE FOUR AXES ARE INDEPENDENT FROM ONE ANOTHER AND CONSTELLATION MADE UP OF THESE AXES BECOMES FOUR-DIMENSIONAL

[FIG.11]

15 I-AXIS SIGNAL

I-AXIS SIGNAL WITH T/2 DELAY

NOT NULL BETWEEN I, Q

NULL BETWEEN "I"S

20 [FIG.12]

100 MODULATION APPARATUS

105 NYQUIST FILTER

106 NYQUIST FILTER

107 NYQUIST FILTER

25 108 NYQUIST FILTER

MODULATED SIGNAL

[FIG.13]

I-Q COMBINED OUTPUT

Q-AXIS MODULATION OUTPUT

I-AXIS MODULATION OUTPUT

5

[FIG.14]

200 DEMODULATION APPARATUS

206 NYQUIST FILTER

207 NYUIST FILTER

10 209 NYQQUIST FILTER

208 NYQUIST FILTER

MODULATED SIGNAL

[FIG.17]

15 MODULATION SCHEME OF PRESENT INVENTION

[FIG.18]

300 MODULATION APPARATUS

301 MAPPING PROCESSING SECTION

20 302 ADDER

303 ADDER

304 ADDER

305 ADDER

105 NYQUIST FILTER

25 106 NYQUIST FILTER

107 NYQUIST FILTER

108 NYQUIST FILTER

- 109 FIRST QUADRATURE MODULATOR
- 110 SECOND QUADRATURE MODULATOR
- 113 THIRD QUADRATURE MODULATOR

MODULATED SIGNAL

5

[FIG.19]

- 400 DEMODULATION APPARATUS
- 405 DEMAPPING PROCESSING SECTION
- 206 NYQUIST FILTER
- 10 207 NYQUIST FILTER
  - 208 NYQUIST FILTER
  - 209 NYQUIST FILTER
  - 204 SECOND QUADRATURE DEMODULATOR
  - 205 THIRD QUADRATURE DEMODULATOR
- 15 201 FIRST QUADRATURE DEMODULATOR
  MODULATED SIGNAL

[FIG.20]

- 500 MODULATION APPARATUS
- 20 301 MAPPING PROCESSING SECTION
  - 302 ADDER
  - 303 ADDER
  - 304 ADDER
  - 305 ADDER
- 25 105 NYQUIST FILTER
  - 106 NYQUIST FILTER
  - 107 NYQUIST FILTER

- 108 NYQUIST FILTER
- 501 FIRST QUADRATURE MODULATOR
- 502 SECOND QUADRATURE MODULATOR
- 503 THIRD QUADRATURE MODULATOR
- 5 MODULATED SIGNAL

[FIG.21]

- 600 DEMODULATION APPARATUS
- 405 DEMAPPING PROCESSING SECTION
- 10 206 NYQUIST FILTER
  - 207 NYQUIST FILTER
  - 208 NYQUIST FILTER
  - 209 NYQUIST FILTER
  - 602 SECOND QUADRATURE DEMODULATOR
- 15 603 THIRD QUADRATURE DEMODULATOR
  - 601 FIRST QUADRATURE DEMODULATOR

MODULATED SIGNAL

[FIG.22]

- 20 700 MODULATION APPARATUS
  - 105 NYQUIST FILTER
  - 106 NYQUIST FILTER
  - 107 NYQUIST FILTER
  - 108 NYQUIST FILTER
- 25 MODULATED SIGNAL
  - 705 CLOCK GENERATION SECTION